

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* THOMAS TSOI HEI MA

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Appeal No. 2003-0659  
Application 09/463,540

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ON BRIEF

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Before McQUADE, WARREN and OWENS, *Administrative Patent Judges*.  
OWENS, *Administrative Patent Judge*.

*DECISION ON APPEAL*

This appeal is from the final rejection of claims 1-16,  
which are all of the claims in the application.

*THE INVENTION*

The appellant claims a method for purging a lean NO<sub>x</sub> trap,  
and claims a lean burn engine and an exhaust gas flow treating  
system having a device capable of carrying out that method.

Claim 1, directed toward the method, is illustrative:

1. A method of purging a lean NOx trap that has a matrix (16) of narrow flow passages and is arranged in the exhaust system of a lean burn engine, the method comprising the steps of providing a flow straightening matrix (12) of narrow flow passages preceding the NOx trap matrix (16) and separated from the NOx trap matrix by a narrow chamber (14), and periodically injecting reducing gases in bursts into the narrow chamber (14), each burst having sufficient mass and flow rate to fill the narrow chamber (14) with the reducing gases and to displace the exhaust gases previously present in the narrow chamber (14) into the narrow flow passages of the flow straightening matrix (12) and of the trap (16) without significantly mixing with the exhaust gases previously present in the narrow chamber.

#### *THE REFERENCES*

Alcorn	4,912,776	Mar. 27, 1990
Martin et al. (Martin)	6,003,305	Dec. 21, 1999 (filed Sep. 2, 1997)
Hartweg et al. (Hartweg)	6,004,520	Dec. 21, 1999 (filed Dec. 12, 1996)

#### *THE REJECTIONS*

The claims stand rejected as follows: claims 1, 2 and 10 under 35 U.S.C. § 102(e) as anticipated by Alcorn or Hartweg, and claims 1-16 under 35 U.S.C. § 103 as obvious over Hartweg in view of Martin, or over Martin in view of Alcorn.

#### *OPINION*

We reverse the aforementioned rejections.

*Rejection under 35 U.S.C. § 102(e) over Alcorn*

"Anticipation requires that every limitation of the claim in

issue be disclosed, either expressly or under principles of inherency, in a single prior art reference." *Corning Glass Works v. Sumitomo Electric*, 868 F.2d 1251, 1255-56, 9 USPQ2d 1962, 1965 (Fed. Cir. 1989).

The appellant's method claim (1) requires a step of periodically injecting reducing gases in bursts into a narrow chamber, each burst having sufficient mass and flow rate to fill the narrow chamber with reducing gases and to displace the exhaust gases previously present in the narrow chamber without significantly mixing with those exhaust gases. The appellants' engine claims (2-9) and claims (10-16) to a system for treating exhaust gases require a device which is capable of carrying out that method step.

Alcorn discloses a method and apparatus for removing nitrogen oxides from a gas stream which can be exhaust gas from an internal combustion engine (col. 1, lines 23-29). The apparatus includes two catalytic reactors in series, the first for oxidizing NO to NO<sub>2</sub> and the second for reducing NO<sub>2</sub> with ammonia which is introduced between the reactors (col. 3, lines 27-31; col. 5, lines 10-26; figure 1). Alcorn teaches that "ammonia is added to the gas stream through the perforated

tube **22**, and the gas stream is thoroughly mixed" (col. 5, lines 21-23).

The examiner argues that Alcorn discloses periodically injecting reducing gases in bursts into a narrow chamber (answer, page 3). Alcorn discloses a space (5) between the catalyst carriers (13 and 14), and teaches that in this space reducing gas (ammonia) is added to the gas stream (col. 5, lines 1-4; col. 5, lines 21-22; figure 1). Alcorn, however, does not disclose that the space is narrow or that the reducing gas is periodically injected in bursts.

The examiner argues that Alcorn's reducing gas displaces the exhaust gases previously present in the space between the catalyst carriers without significantly mixing with the exhaust gases previously present in that space (answer, pages 3-4). This interpretation of Alcorn is incorrect. What Alcorn teaches is that the reducing gas is added to the gas stream through a perforated tube and the gas stream is thoroughly mixed (col. 5, lines 21-23).

The examiner argues that Alcorn's injected reducing gas must be at a higher pressure than the exhaust gas and that, therefore, the reducing gas displaces the exhaust gas and continues to expand to fill the space between the catalyst carriers (answer,

page 9). Alcorn's teaching that the reducing gas and the exhaust gas are thoroughly mixed in the space between the catalyst carriers (col. 5, lines 21-23) indicates that the examiner's reasoning is incorrect.

The examiner, therefore, has not carried the burden of establishing a *prima facie* case of anticipation over Alcorn of the invention claimed in any of the appellant's claims.

*Rejection under 35 U.S.C. § 102(e) over Hartweg*

Hartweg discloses a device for reducing pollutants in internal combustion engine exhaust gas (col. 1, lines 7-20). "By adding reducing agent at a point after which the catalyst no longer has any catalytic effect with respect [to] at least one of the pollutants, the reduction of pollutants, particularly of nitrogen oxides, can be increased to more than 40%" (col. 1, lines 42-46). In one embodiment there are three catalyst segments, the first two being separated by space 8 and the second two being separated by space 8' (figure 3). Reducing agent is introduced through a nozzle ring into space 8 and through an atomizing nozzle into space 8' (col. 3, lines 36-41). Hartweg teaches that "[t]he reducing agent flows into the respective space 8 and 8' and mixes with the already partially purified exhaust gas. The space 8 and 8' can therefore also be regarded

as a sort of mixing chamber" (col. 3, lines 42-45).

The examiner argues that Hartweg's chambers 8 and 8' are narrow and that Hartweg periodically injects reducing gases in bursts into these chambers (answer, page 4). Hartweg, however, does not disclose that spaces 8 and 8' are narrow or that the reducing agent is injected in bursts. Hartweg merely discloses is that the reducing agent flows into spaces 8 and 8' (col. 3, line 42).

The examiner argues that Hartweg's reducing agent fills spaces 8 and 8' and displaces the exhaust gases previously present in those spaces without significantly mixing with the exhaust gases (answer, pages 4 and 9). Hartweg's teaching that "[t]he reducing agent flows into the respective space **8** and **8'** and mixes with the already partially purified exhaust gas" (col. 3, lines 42-43) indicates that the examiner's interpretation of the reference is incorrect.

Thus, the examiner has not established a *prima facie* case of anticipation by Hartweg of the invention claimed in any of the appellant's claims.

*Rejection under 35 U.S.C. § 103  
over Martin in view of Alcorn*

Martin discloses a flameless thermal oxidizer for

simultaneously reducing the concentrations of soot and oxides of nitrogen in internal combustion engine exhaust (col. 5, lines 29-32 and 45-48). The thermal oxidizer (10a) includes a reductant delivery system (148) for injecting a reductant stream (7) into a process stream (9) which contains exhaust gas (col. 8, lines 12-17; col. 11, lines 4-6). The reductant preferably is injected upstream of a matrix (14a), which is a bed of solid, heat resistant media, to enable the reductant to be heated by the matrix and to enhance mixing (col. 8, lines 25-26; col. 11, lines 6-8). The reductant also can be injected directly into the matrix, or can be combined with an air stream (4), fuel stream (5) or hot gas stream (6), each of which is a component of the process stream (col. 11, lines 9-14; figure 1).

The examiner argues that Martin discloses "periodically injecting reducing gases in bursts into the narrow chamber (88)" (answer page 6). Martin calls chamber 88 a fuel vaporization chamber and discloses spraying supplemental fuel into that chamber (col. 10, lines 38-53). Even if the supplemental fuel can be considered a reducing gas,<sup>1</sup> Martin does not disclose

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<sup>1</sup> Martin's supplemental fuel stream (5) and reductant stream (7) are different streams (col. 10, lines 42-43; col. 11, lines 5-6).

periodically injecting the supplemental fuel in bursts into the chamber and does not disclose that the chamber is narrow.

The examiner argues that Martin discloses that chamber 88 is filled with reducing gas which displaces the exhaust gases previously present in the chamber without significantly mixing with those exhaust gases (answer, pages 6-7 and 9). This argument is based upon an incorrect interpretation of the reference. Chamber 88 is a fuel vaporization chamber which supplies vaporized supplemental fuel for mixing with the process stream containing exhaust gas (col. 10, lines 41-43; figure 11). Martin does not disclose that chamber 88 ever contains exhaust gas. Moreover, as discussed above, Martin teaches that his reductant gas mixes with the exhaust gas.

The examiner relies upon Alcorn only for a disclosure of a flow straightening matrix (answer, pages 7-8), and not for any disclosure which remedies the above-discussed deficiency in Martin.

Accordingly, we conclude that the examiner has not carried the burden of establishing a *prima facie* case of obviousness of the invention claimed in any of the appellant's claims over the combined teachings of Martin and Alcorn.

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*Rejection under 35 U.S.C. § 103  
over Hartweg in view of Martin*

The examiner argues that Hartweg and Martin disclose the step and device recited in the appellant's claims for periodically injecting reducing gases (answer, pages 4-6). This argument is not well taken for the reasons given above regarding the rejection under 35 U.S.C. § 102(e) over Hartweg and the rejection under 35 U.S.C. § 103 over Martin in view of Alcorn.

Thus, we conclude that the examiner has not established a *prima facie* case of obviousness of the invention claimed in any of the appellant's claims over the combined teachings of Hartweg and Martin.

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*DECISION*

The rejections of claims 1, 2 and 10 under 35 U.S.C. § 102(e) as anticipated by Alcorn or Hartweg, and claims 1-16 under 35 U.S.C. § 103 as obvious over Hartweg in view of Martin, or over Martin in view of Alcorn, are reversed.

*REVERSED*

JOHN P. McQUADE	)	
Administrative Patent Judge	)	
	)	
	)	
	)	BOARD OF PATENT
CHARLES F. WARREN	)	
Administrative Patent Judge	)	APPEALS AND
	)	
	)	INTERFERENCES
	)	
TERRY J. OWENS	)	
Administrative Patent Judge	)	

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